Index no:.....

UNIVERSITY OF RUHUNA – FACULTY OF ALLIED HEALTH SCIENCES

DEPARTMENT OF PHARMACY

FIRST BPHARM PART II EXAMINATION – AUGUST 2022

PH 1213 PHARMACEUTICAL CHEMISTRY II (SEQ) – OLD SYLLABUS

TIME: THREE HOURS

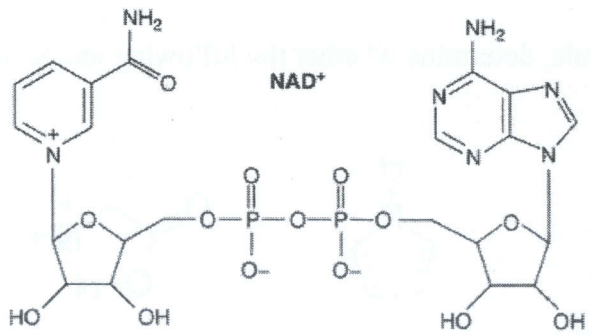
INSTRUCTIONS

- There are **six** questions in parts **A** and **B** in this paper.
- Answer **all** questions.
- No paper should be removed from the examination hall.
- Do not use any correction fluid.

PART A

01.

1.1 Consider the structure of Nicotinamide Adenine Dinucleotide (NAD) shown below:



1.1.1 Indicate each of the following:

a. names of the sugar/s and the nitrogen base/s. (***10 marks***)
b. chiral centers with an asterisk (*). (***10 marks***)
c. anomeric carbon atom(s). (***05 marks***)
d. N-glycoside bond(s) specifying whether α or β. (***10 marks***)
e. numbering of the sugar units and the nitrogen base. (***10 marks***)

1.1.2 Draw the Fisher projection of the open chain form of the sugar unit and its C-3 epimer. (***10 marks***)

1.2

1.2.1 The α-amino acids can be classified into different groups based on their side chains. Group the following amino acids into acidic, basic, and aromatic amino acids and give their one-letter codes. (***20 marks***)

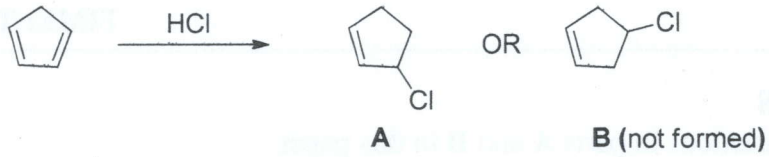
Asp, Glu, His, Lys, Phe, Tyr

1.2.2 Draw the chemical structures of Asp, Lys and Phe. (***15 marks***)

1.3 Draw the structure of linoleic acid (18:2, ω-6). (***10 marks***)

02.

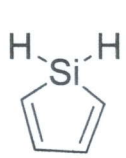
2.1 The following reaction produced **only one** product **A**. Draw the intermediates that would yield each product and explain why **B** is not observed. (***15 marks***)



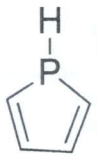
A **B (not formed)**

2.2 Pyridine N-oxide is more activated for electrophilic and nucleophilic attack at both positions C-2 and C-4 than pyridine itself. Draw all the resonance forms for pyridine N-oxide to show this observation. (***15 marks***)

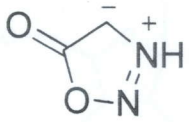
2.3 Using the Hückel rule, determine whether the following molecules are aromatic or not. (***20 marks***)



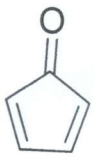
2.3.1.



2.3.2



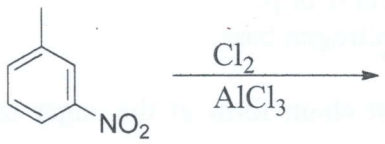
2.3.3



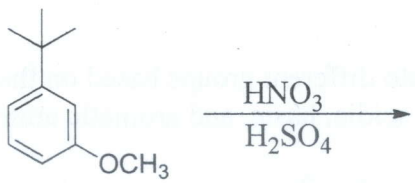
2.3.4

2.4 Draw the structure(s) of the major product(s) of following substitution reactions. Give a brief explanation for your answers. (***50 marks***)

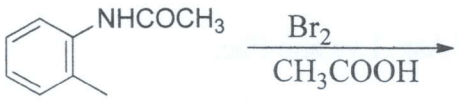
2.4.1

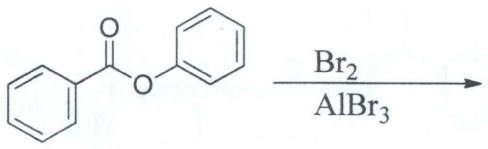


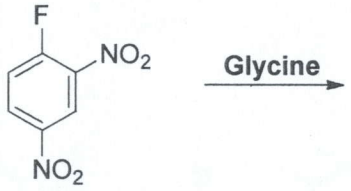
2.4.2



2.4.3



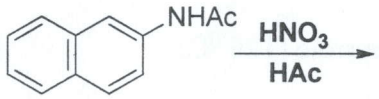
2.4.4 

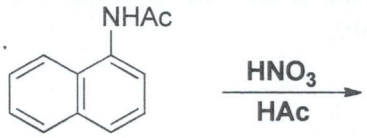
2.4.5 

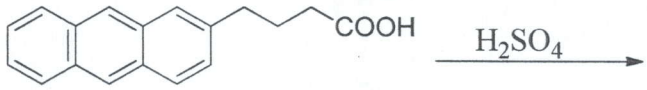
03.

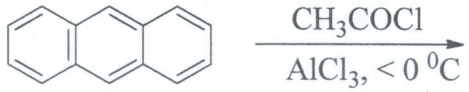
3.1 Draw the structure(s) of the major product(s) of following substitution reactions.

(***40 marks***)

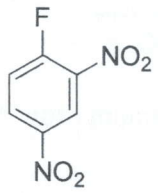
3.1.1 

3.1.2 

3.1.3 

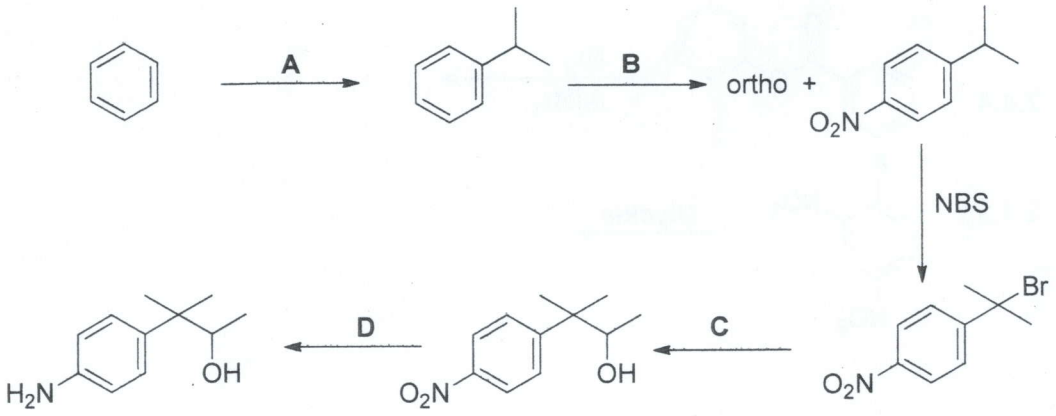
3.1.4 

3.2 Starting from benzene, show a reaction sequence that could be used to prepare the following compound, 1-Fluoro-2,4-dinitrobenzene (commonly called Sanger's reagent) which is used for sequencing proteins. (***30 marks***)



3.3 Write down the appropriate chemical reagents (**A**, **B**, **C**, and **D**) for the transformations given below and draw the structure of **NBS**. (***30 marks***)

Index no:.....

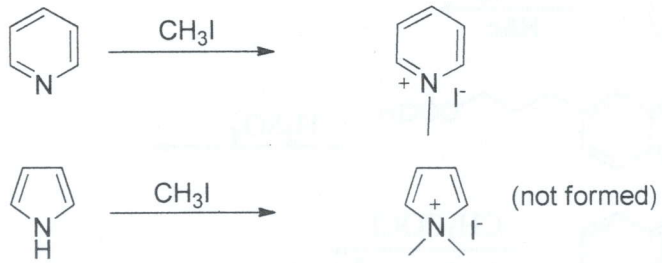


04.

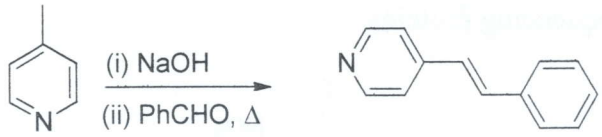
4.1 Explain the following.

4.1.1 Furan (32 ^{0}C) has lower boiling point than pyrrole (126 ^{0}C). (***10 marks***)

4.1.2 Pyridine reacts with methyl iodide to provide a salt but pyrrole does not react. Provide two possible reasons for this reactivity. (***15 marks***)



4.2 In the presence of a base/Lewis acid, 4-methylpyridine reacts with benzaldehyde in the condensation reaction shown below:

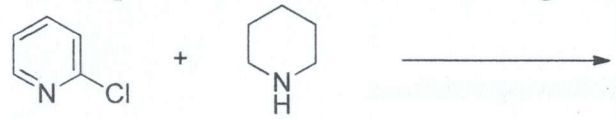


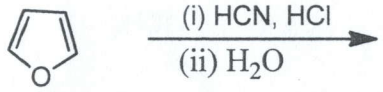
4.2.1 Propose a reasonable mechanism for the formation of the product above. (***15 marks***)

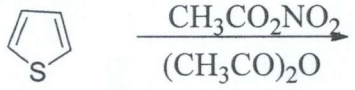
4.2.2 Under the same condition, 3-methylpyridine does not react with benzaldehyde in the condensation reaction. Explain this difference in reactivity. (***05 marks***)

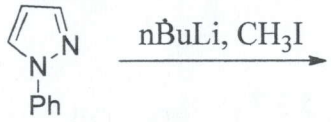
4.2.3 Would you expect 2-methylpyridine to react with benzaldehyde under these conditions? Explain. (***05 marks***)

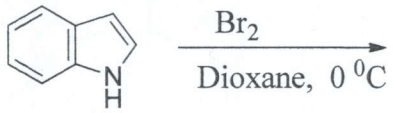
4.3 Predict the product expected from each of the following reactions. (***50 marks***)

4.3.1 

4.3.2 

4.3.3 

4.3.4 

4.3.5 

05.

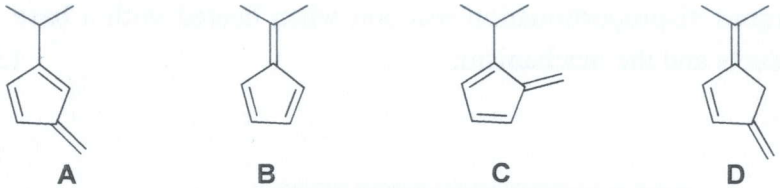
5.1

5.1.1 Show the structures of species **X** and **Y** in the following acid-base reaction and predict which side of the equilibrium is favored. (***10 marks***)

5.1.2 Arrange the following compounds in order of increasing acidity. (***15 marks***)

5.1.3 Arrange the following compounds in order of increasing basicity. (***15 marks***)

5.2 Methyl protons of one of the compounds (**A-D**) is more acidic than others. Indicate that one and explain its high acidity. (***10 marks***)



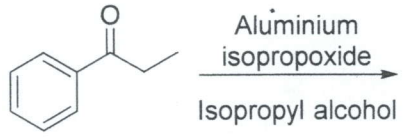
Index no:.....

PART B

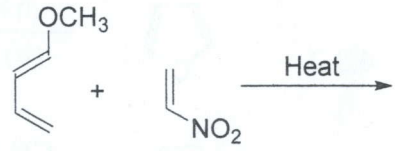
5.3 Draw the major products of following reactions. (***50 marks***)

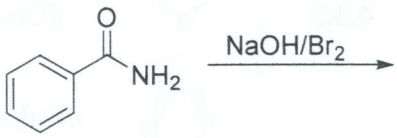
5.3.1 

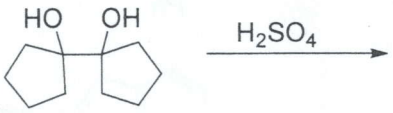
5.3.2 

5.3.3 

5.3.4 

5.3.5 

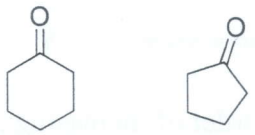
5.3.6 

5.3.7 

06.

6.1

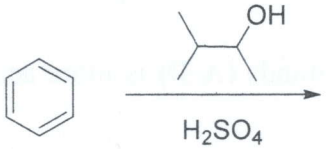
6.1.1 Draw the structures of possible aldol condensation products from a mixture of cyclohexanone (**A**) and cyclopentanone (**B**). (***20 marks***)



A B

6.1.2 Draw the mechanism showing correct arrow pushing for the formation of one of the products that you have drawn under part 6.1.1. (***20 marks***)

6.2 Identify the major and minor products expected from the following reaction. Briefly explain your answer using the mechanism for formation of the electrophile. (***30 marks***)



6.3 Benzaldehyde undergoes disproportionation reaction when heated with a base. Draw the structures of the products and the mechanism. (***30 marks***)

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